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Claims:

1. An electrical switch having an operating element which can be moved in a spring-loaded manner and has a control cam, and having connecting contacts which can be connected to one another via a contact link which can be moved by the operating element to different switch positions, with the connecting contacts, contact link and operating element being arranged in an enclosure, wherein the control cam (25) is in the form of a horizontal figure eight, at whose cross point (26) a deflector (32) is arranged, which can rotate and is automatically set by the movement of the switching element (19) to a blocking position which allows passage through the crossing point (26) alternately in one direction and the other.

2. The electrical switch as claimed in claim 1, wherein a switching element (19) is arranged between the control cam (25) and the contact link (18), is drive-coupled to the control cam (25), and in the process positively controls the switch positions of the contact link (18).

3. The electrical switch as claimed in claim 2, wherein the switching mechanism, which comprises connecting contacts (16, 17), the contact link (18) and the switching element (19), is arranged in a separate enclosure body (11), to which a connecting enclosure (12), which guides the spring-loaded operating element (24), can be coupled.

4. The electrical switch as claimed in claim 1, wherein the deflector (32) is formed from a T-shaped blocking cruciform which passes through the depth of the control cam (25) and whose center limb (32) can be pivoted alternately into recesses (34) at the edge of the control cam (25), while the lateral webs (35) of the blocking cruciform alternately engage in the

movement path of the control cam (25) in order to operate the blocking cruciform.

5. The electrical switch as claimed in claims 1 and 4, wherein the deflector (32) comprises a flange bolt, whose collar (36) is formed from an approximately semicircular sector part and a center limb (33) which emerges opposite and whose length is greater than the radius of the sector part.

6. The electrical switch as claimed in claim 1, wherein the curves (27) of the control cam (25), which is in the form of a horizontal figure eight, are provided on their lower face with tips (28) which define the limit positions of the switching element (19).

7. The electrical switch as claimed in claim 6, wherein the inner walls opposite the tips (28) have inclined surfaces (29), which are inclined with respect to the crossing point (26).

8. The electrical switch as claimed in claims 6 and 7, wherein the tips (28) arranged on the lower faces of the control cam (25) are arranged at different heights to one another.

9. The electrical switch as claimed in one or more of claims 1 and 6 to 8, wherein the control cam (25) has an insertion groove (30), which originates from the crossing point (26) of the control cam (25), emerges downwards from the operating element (24) and is arranged between the curves (27) of the horizontal figure eight, for the tripping finger (23) of the switching element (19).

10. The electrical switch as claimed in one or more of claims 1 to 9, wherein the operating element (24) having a control cam (25) which has tips (28) at the

same height can be replaced by an operating element (24) which has tips (28) of different heights on its control cam (25), and in addition identical operating elements (24) can be replaced by one another in the connecting enclosure (12).

Key word: "cam-controlled push-button switch"

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Electrical switch

The invention relates to an electrical switch having an operating element which can be moved in a spring-loaded manner and has a control cam, and having connecting contacts which can be connected to one another via a contact link which can be moved by the operating element to different switch positions, with the connecting contacts, contact link and operating element being arranged in an enclosure.

In the case of a switch of the type mentioned above which is known from DT-Gbm 7 425 409, the operating element is directly connected to the contact link via spring parts. In this case, the operating element has a cylindrical section in the form of a handle, and a semicircular section in whose straight outer casing a groove, which forms the control cam, is incorporated. This control cam, which is arranged on the operating element, interacts via a sphere which can be moved in it with a linear guide track on the switch enclosure. In this case, the control cam and the guide track each have a depth which corresponds to half of the sphere diameter, so that the sphere always remains in the linear guide track, and the operating element is fixed in one of two switch positions via the control cam. The control cam is thus used exclusively for fixing the switch positions and not for operation of the contact link itself. A switch such as this can be used only where the operating direction matches the switching direction. Furthermore, in the case of a switch such as

this, the control cam in each case has a single associated contact link.

The object of the invention is to provide a switch of simple design for cost-effective production and easy installation, in which the control cam is used not only for reliably carrying out alternating switching movements of the contact link but also to fix its switch positions.

According to the invention, this is achieved in that the control cam is in the form of a horizontal figure eight, at whose cross point a deflector is arranged, which can rotate and is automatically set by the movement of the switching element to a blocking position which allows passage through the crossing point alternately in one direction and the other. This correctly avoids incorrect switching operations and ensures that on and off switching operations continually follow one another, alternately.

In order to allow universal use of the switch with different movement directions of the contact link and operating element, and in order to allow only a single operating element to be used for switching a plurality of contact links, a switching element is preferably arranged between the control cam and the contact link, is drive-coupled to the control cam, and in the process positively controls the switch positions of the contact link. This results in versatile use, if the switching mechanism which comprises connecting contacts, the contact link and the switching element, is preferably arranged in a separate enclosure body, to which a connecting enclosure, which guides the spring-loaded operating element, which is provided with the control cam, can be coupled.

In order that the crossing point of the control cam can only ever be released in a direction such that the

tripping finger of the switching element is guided by one curve of the control cam with respect to its other curve, according to one further feature of the invention, the deflector is advantageously formed form a T-shaped blocking cruciform which passes through the depth of the control cam and whose center limb can be pivoted alternately into recesses at the edge of the control cam, while the lateral webs of the blocking cruciform alternately project into the movement path of the control cam in order to operate the blocking cruciform.

A shape which makes it easier to manufacture the deflector and the deflector holder at the crossing point of the control cam is achieved according to one preferred refinement feature of the invention in that the deflector comprises a flange bolt, whose collar is formed from an approximately semicircular sector part and a center limb which emerges opposite and whose length is greater than the radius of the sector part.

In order to fix the switch positions in a defined manner, the curves of the control cam, which is in the form of a horizontal figure eight, are provided on their lower face with tips which define the limit positions of the switching element. In order to ensure that the tripping finger, which slides in the movement path of the control cam, of the switching element starts its movement at the start of each switching process reliably in the direction of the crossing center point of the control cam, the inner walls opposite the tips of the control cam preferably have inclined surfaces, which are inclined with respect to the crossing point.

In order to allow the respective switch position to be read on the operating element, according to a further refinement feature of the invention, the tips arranged on the lower faces of the control cam are arranged at

different heights to one another. This also results in a different height for the operating element in the individual switch positions, so that the respective switch position can be read correctly if the operating element is appropriately marked at this position. In order to simplify the installation of the operating element, a further feature of the invention proposes that the control cam be provided with an insertion groove, which originates from the crossing point of the control cam, emerges downwards from the operating element and is arranged between the curves of the horizontal figure eight, for the tripping finger of the switching element.

The invention will be explained in more detail in the following text and is illustrated in an exemplary form in the drawing, in which:

figure 1 shows a horizontal section along the line I-I illustrated in Figure 2 of the switch installed in an integral enclosure,

figure 2 shows a longitudinal section along the line II-II in Figure 1 through the same switch,

figure 3 shows a vertical section along the line III-III in Figure 1 through the same switch, looking in the direction of the operating element which has the control cam,

figure 4 shows a vertical section, corresponding to Figure 3, through the switch with an operating element which has a modified control cam,

figure 5 shows a switch comprising two enclosure parts which are connected to one another, with a plurality of switching mechanisms being arranged in one enclosure body, which can be switched jointly by an operating element which is arranged in a connected enclosure,

figure 6 shows the procedure for a switching process on the basis of the control cam, which acts on the tripping finger of the switching element, in seven movement positions, which are annotated "a" to "g".

The push-button-operated switch is accommodated with its switching mechanism in an enclosure 10. In the exemplary embodiment shown in figures 1 to 4, the enclosure 10 comprises an enclosure body 11 and a connecting enclosure 12 which is integrally connected to it. The actual switching mechanism comprising the connecting contacts 16 and 17, the contact link 18 which connects and disconnects the connecting contacts 16 and 17, and the switching element 19 which acts on the contact link 18 via a connection spring 22 are accommodated in the enclosure body 11. The connecting enclosure 12 is used to hold the operating element 24, which is provided with the control cam 25 and is held in its blocking positions by a compression spring 31.

The switching element 19 is essentially formed from a sliding piece 20, from one face of which a switching finger 21 projects, whose attachment 38 engages in the connection spring 22, while a tripping finger 23 which engages in the control cam 25 emerges from the opposite face of the sliding piece 20. The sliding piece 20 is mounted in the guide area 13 of the enclosure body 11 such that it can move in the switching direction, and, with its switching finger 21 and its tripping finger

23, passes through cutouts 39 and 40 in the enclosure body 11. The operating element 24 is provided with the control cam 25 and is arranged such that it can move in a guide groove 14 in the connecting enclosure 12, transversely with respect to the switching movement of the switching element 19. As can be seen in particular in figures 1 and 2, the connecting enclosure 12 can be provided, for example with a foot flange 15 for attachment of the switch, which foot flange 15 has holes for holding attachment means.

The control cam 25 which acts on the tripping finger 23 of the switching element 19 is in the form of a horizontal figure eight and is incorporated like a groove in the operating element 24. The two curves 27 of the control cam 25 that is in the form of a horizontal figure eight are separated from one another at their crossing point 26 by a deflector 32. Each of the curves 27 has tips 28 on the lower face of the control cam 25, which tips 28 hold the tripping finger 23 firmly in each of the limit positions of the switching element 19. In order to reliably move the tripping finger 23 of the switching element 19 to the crossing point 26 of the control cam 25 when the operating element 24 is pushed down, the inner walls, opposite the tips 28, of the control cam 25 are provided with inclined surfaces 29 inclined with respect to their crossing point 26. An insertion groove 30 emerges downwards from the operating element 24, from the control cam 25, in the center between the two tips 28, so that the tripping finger 23 can be inserted into the control cam 25.

As can be seen in particular in Figure 6, the deflector 32, which can rotate and is arranged at the crossing point 26 of the control cam 25, may be in the form of a T-shaped locking cruciform whose center limb 33 can be pivoted into recesses 34 on the inner wall of the control cam 25. When the center limb 33 of the

deflector 32 has been pivoted into one of the two recesses 34, one of the two lateral webs 35 always projects into the movement path of the control cam 25. Before and after each switching process, the tripping finger 23 of the switching element 19 is located in one of the two tips 28 of the control cam 25. A switched-on position, as is illustrated in the figures, is used as the starting point in order to explain the switching process. In this case, the tripping finger 23 is located in the right-hand tip 28 of the control cam 25, with the deflector 32 assuming the position shown in Figure 6a. When the operating element 24 is pushed down, the inner face of the control cam 25 slides over the tripping finger 23, which maintains the same height all the time, and starts to move the tripping finger 23 to the left. In this case, first of all, as can be seen in Figure 6b, the tripping finger 23 is moved into the area of the crossing point 26 of the control cam 25. In the process, the center limb 33 of the deflector 32 prevents the tripping finger 23 from entering the upper part of the right-hand curve 27 of the control cam 25. In fact, if the operating element 24 is pushed down further, this results in a pivoting movement of the deflector 32, by the tripping finger 23 pushing against the lateral web 35, which projects into the movement path of the control cam 25, of the deflector 32. The pivoting movement of the deflector 32 is illustrated in three stages in Figures 6c to 6e. During the pivoting movement of the deflector 32, the tripping finger 23 is moved further to the left, and is moved into the upper part of the left-hand curve 27 of the control cam 25 until it assumes the position which can be seen in Figure 6f. In this position, the operating element 24 cannot be pushed down any further and in fact, after the operating element 24 has been released, the control cam 25 slides upwards to the position which can be seen in Figure 6g, as a result of the load being removed from the compression spring 31, so that the tripping finger 23 is surrounded by the left-hand tip 28 of the

control cam 25, and is fixed in this position. During the movement of the control cam 25 described above, the tripping finger 23 was moved linearly from the right-hand tip 28 to the left-hand tip 28 of the control cam 25. During the process, the switching finger 21 was also pushed from right to left, so that the contact link 18 was pivoted from its switched-on position, as shown in Figure 1, to a switched-off position, which is not illustrated. If the intention is now to move the tripping finger 23 to the switched-on position again, pushing the operating element 24 down results in the tripping finger 23 once again being moved to the crossing point 26 of the control cam 25 and, when the operating element 24 is pushed down further, the deflector 32 pivots in the counterclockwise sense to the position shown in Figure 6b, during which process the tripping finger 23 can enter the right-hand upper part of the curve 27 of the control cam 25 and, once the operating element 24 is released, comes to rest in the right-hand tip 28 of the control cam 25. The tripping finger 23 has thus been moved from its left-hand position linearly to the right again and reaches the position which can be seen in Figure a, in which the contact link 18 connects the two connecting contacts 16 and 17 to one another again, thus switching the switch on again.

A shape which not only makes it easier to produce the deflector 32 but also to produce the control cam 25 in the area of its crossing point 26 is achieved by the deflector 32 being in the form of a flange bolt, as can be seen in Figures 3 and 4. In this case, the collar 36 which replaces the lateral webs 35 on the deflector 32 comprises an approximately semicircular sector part, whose center point matches the center of the journal 37 of the deflector 32. A center limb 33 which originates from the center point of the deflector and whose length from the center point of the journal to its tip is greater than the radius of the sector part, in order

that the tip of the center limb 33 can pivot into the recesses 34 in the control cam, extends opposite the central area of the semicircular sector part. The depth of the recesses 34 and the thickness of the center limb 33 are in this case designed such that, when the center limb 33 is pivoted into the recess 34, this results in a smooth transition between the inner wall of the control cam 35 and that surface of the center limb 33 which faces the movement path of the control cam. The sector part which forms the collar 36 also has a curve length such that, when the deflector 32 is in the pivoting-in state, the collar 36 always ends precisely at the point where the outer wall of the control cam 25 starts.

In order that the respective switching state of the switch ("on" or "off") can be read at the position of the operating element 24, the tips 28 are at different heights on the lower face of the curves 27 of the control cam 25, so that, in the one switch position, the operating element 24 projects higher out of the connecting enclosure 12 than when in the other switch position. In the exemplary embodiment shown in Figure 4, the operating element 24 projects higher out of the connecting enclosure 12 when the switch is in the switched-on position than when it is in its switched-off position. In order to clearly identify the switching positions, the operating element 24 may have markers 41, as illustrated in Figure 4, which are at the same time provided with associated inscriptions.

As illustrated in Figure 5, a single connecting enclosure, to which the operating element is fitted, can be connected to an enclosure body 11 which holds a plurality of switching mechanisms. In this case, the sliding piece which can move in the guide area 13 is in the form of a push rod 42, which has a number of switching fingers 21, corresponding to the number of switching mechanisms arranged in the enclosure body 11,

on one side of the push rod 42. This allows the switching of a plurality of contact pairs 16 and 17 at the same time using only one operating element 24, via its control cam 25 and the tripping finger 23, which engages in this control cam and is connected to the push rod 42.

As is illustrated in particular in Figure 2, the enclosure 10 can be longitudinally split for installation purposes. If the switch has a plurality of switching contact pairs as shown in the solution illustrated in Figure 5, only the enclosure body 11 need be longitudinally split, however, for installation purposes.

The embodiments of the invention which have been described and are illustrated in the drawing represent only a small number of exemplary embodiments, and the invention is in no way restricted to them. In fact, many other embodiments are also possible. For example, it is thus feasible to arrange the connecting contacts 16 and 17 on the other side of the enclosure body 11 as well, in contrast to the embodiment illustrated in Figure 2. It is self-evident that the enclosure 10 can also be fixed in a different manner than via the flange 15, and that the enclosure 10 itself may, for example, be fixed by means of brackets to a base body. Finally, it is also possible to use a different switching mechanism from that illustrated, whose switching direction can also match the operating direction of the operating element 24 if, for example, the control cam 25 is arranged in a position rotated through 90° in the operating element 24. Furthermore, each operating element 24, which is provided with a control cam 25, can be replaced by one with a modified cam shape, handle surface and the like, or by a differently colored operating element.

List of reference symbols

10	Enclosure	34	Recess
11	Enclosure body	35	Lateral web
12	Connecting enclosure	36	Collar
13	Guide area	37	Journal
14	Guide groove	38	Attachment
15	Foot flange	39	Cutout
16	Connecting contact	40	Cutout
17	Connecting contact	41	Marker
18	Contact link	42	Push rod
19	Switching element		
20	Sliding piece		
21	Switching finger		
22	Connection spring		
23	Tripping finger		
24	Operating element		
25	Control cam		
26	Crossing point		
27	Curve		
28	Tip		
29	Inclined surface		
30	Insertion groove		
31	Compression spring		
32	Deflector		
33	Center limb		

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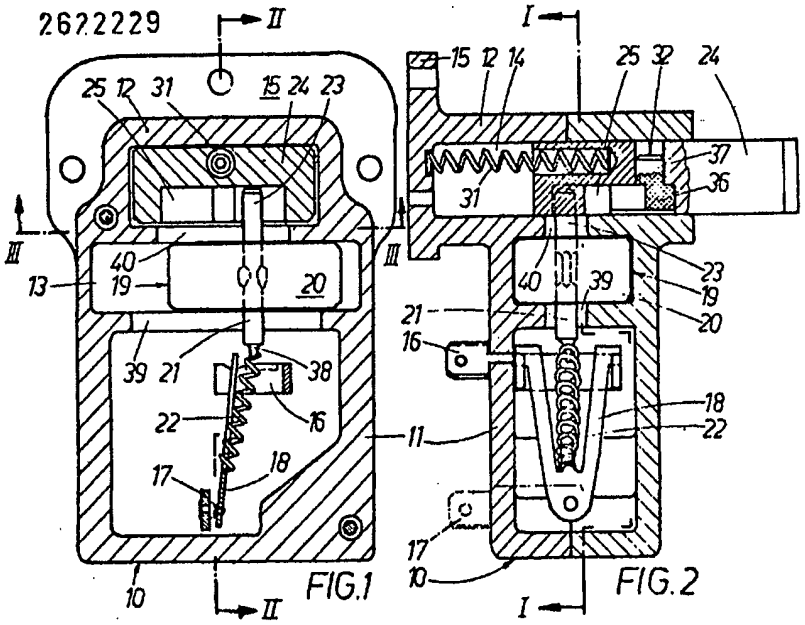

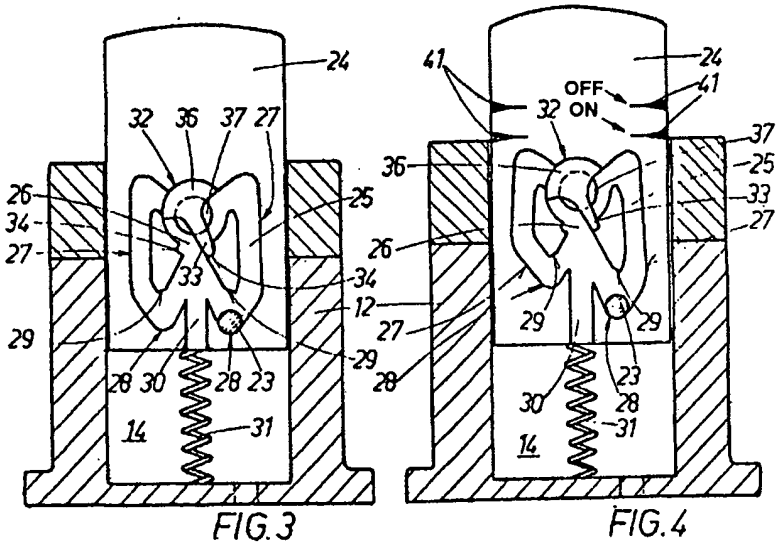

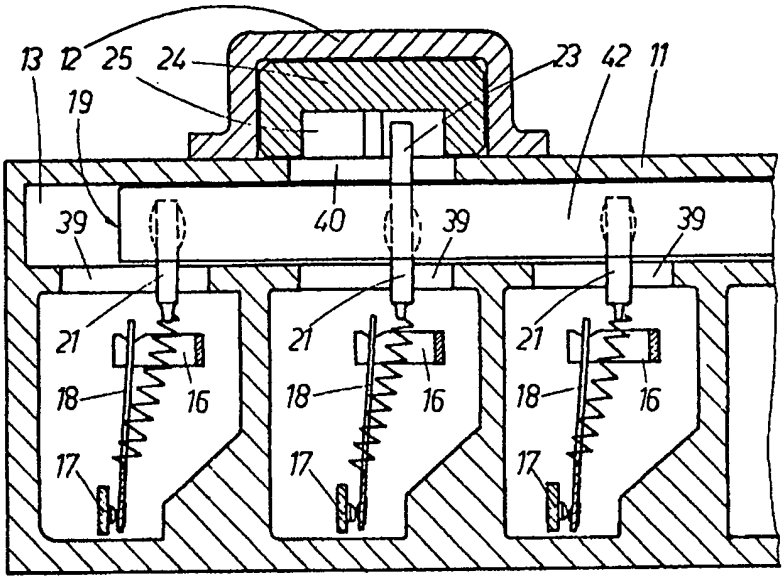

FIG. 5

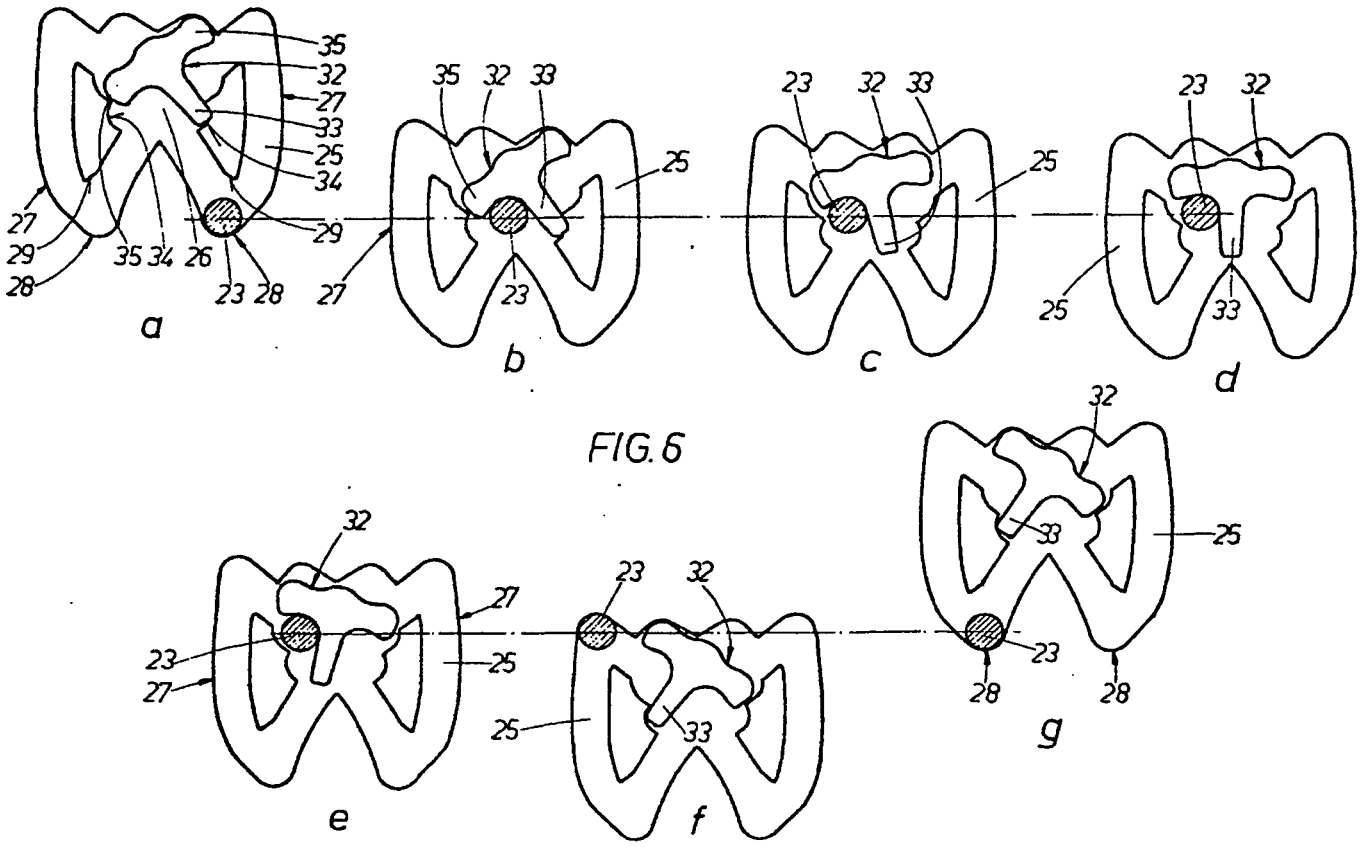
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FIG. 6